Dr. Schmidt further announces as one of the important results of his investigations, that the lymphatics have their commencement in the biliary capillary nets. Though the drawings of the preparations appear to demonstrate this conclusion, the view appears to us so improbable that, before admitting it, we must wait for its confirmation by others.

As Dr. Schmidt has proved himself such an able and patient investigator, we hope he will continue his researches in the difficult field of microscopic anatomy. J. L.

ART. XXII.—*A Report on the Microscopic Objects found in Cholera Evacuations.* By TIMOTHY RICHARD LEWIS, M. B., Assistant Surgeon to Her Majesty's British Forces attached to the Sanitary Commission with the Government of India. Printed by order of the Government. 8vo. pp. 68. Plates XXIV. and three maps. Calcutta: 1870.

THIS brochure, which has been put forth under the patronage of the British Indian Government, gives another heavy blow to the asserted production of constitutional disease by fungi. So far as can be judged from internal evidence, its author is well fitted for his task, and, as an *attaché* of the Governmental Sanitary Commission, has had most ample opportunities of studying the disease, both as endemic in Calcutta and as epidemic in Bombay, Lucknow, etc.

After a concise statement of what has been found by various observers in cholera stools, Doctor Lewis first takes up the consideration of the cysts found by Budd, Brittan, Hallier, etc., and by them believed to be peculiar to the dejecta of the disease. He shows that there are not one but several distinct bodies; that some of them are the ova of acari, some the ova of intestinal worms, and some truly portions of cryptogamic plants. So far, however, from the latter (the cholera fungi of Budd) being peculiar they belong, as long since was shown by M. Busk, to a species of uredo, the bunt of wheat, and may be frequently found in coarse bread. Dr. Lewis, therefore, concludes 1, "that no cysts exist in choleraic discharges which are not found under other conditions," and 2, "that cysts or 'sporangia' of fungi are but very rarely found under any circumstances in alvine discharges."

The next subject which claims attention are the so-called "spores." These are shown to be divisible into four sets. 1. Globules, which are nothing but aggregations of fatty matter. 2. Blood cells, which have been effused, and are swollen by endosmose or otherwise altered. 3. Corpuscles, imbedded in a tenacious substance composing the well-known "flakes" of the rice-water stool. 4. Globular, inactive states of certain infusoria.

The only one of these about which there is any difficulty is the third class. These corpuscles are transparent, globular bodies, resembling white blood globules, and, under favourable circumstances, exhibiting movements "exactly similar to those seen in the blood lymph, chyle, and (so-called) mucous corpuscles." They are indistinguishable from the similar bodies found in the fluid of blisters, and "doubtless owe their origin to effused blood plasma, which assumes with great rapidity a low, ill-defined, and non-progressive organization."

With these corpuscles were certain globules, about which Dr. Lewis wishes to speak "with great caution." Frequently, he says, a globule has been observed for some time, and finally disposed of as being an oil one, when suddenly it is seen to protrude a portion of its substance; retract it, and while doing so another protrusion becomes visible at some other portion of the little mass, and then, perhaps, it will shift its position, exactly after the manner of an amœba. These are frequently hyaline in a fresh stool, but generally granular; no trace of a nucleus or contractile vacuole can be observed. Sometimes they are very numerous; but when there are other corpuscles in the field, which act in a somewhat similar manner, it is impossible to say to which class they belong, unless, indeed, they move across the field like an ordinary amœba, and not merely content themselves with protruding portions of their substance into the surrounding fluid, as was stated the corpuscles last described did. Dr. Lewis thinks, though not confidently, that these bodies are the amœboid condition of a protozoon, and that they are the "swollen spores" of Hallier. In this connection Dr. Lewis expresses the opinion, based on many hundreds of examinations, that debris of columnar epithelium is very rarely found in cholera stools passed during life, although often abundant in the fluid found in the intestines after death.

A somewhat peculiar protozoon was frequently found, both in the motile and still state, in the dejecta of cholera patients, but was by no means always present, and was also observed in the watery passages produced by the action of a purgative upon a healthy man. Dr. Lewis, therefore, concludes that there are no spores or animalculæ at all peculiar to the stools of cholera.

It is well known that Hallier's theory of cholera differs from those preceding it, in asserting that the fungus—the essential cause of the disease—exists in the stools chiefly, if not entirely, in the form of exceedingly minute particles, which are without definite form or character, and yet are capable, under favourable circumstances, of developing the matured plants of a peculiar fungus, the most perfect type of which is parasitic on the rice plant; or, in other words, that these minute particles (micrococci) are the minute germs of such fungus.

The readers of this Journal can well estimate the value to be attached to Hallier's culture experiments from the results of Dr. Billings' repetition of some of them, as published here not long since (Oct. 1869, p. 520), and are therefore prepared to learn that Dr. Lewis, after carefully repeating the culture of the stools after the manner of the German *savant*, failed entirely to find any plant developed which may not be readily produced from other similar materials.

Further than this, Dr. Lewis has been fortunate enough to develop the exact fungal forms figured by Professor Hallier as peculiar to cholera, and that, too, not merely from the stools of the disease, but from those of a healthy individual, and therefore concludes "that no especial fungus has been developed in cholera stools, the fungus described by Hallier being certainly not confined to such stools."

It has been supposed by some that the stools of cholera patients contain a very large number of monads, bacteria, vibriones, and similar forms; but Dr. Lewis states: "Thus far I have not found this to be the case; indeed, the discharges of cholera patients, if examined immediately, do not contain such quantities of these minute bodies, especially if the stools have been voided in rapid succession, consequently have not been long detained in the intestinal canal. Neither have I been able, after repeated observations, to find that, during the decomposition of a cholera discharge, a greater number of the minute bodies associated with putrefaction were developed in it, than were developed under similar circumstances in ordinary alvine discharges; nor have I been able to find that any peculiar growth, animal or vegetable, will proceed from the one which does not proceed from the other." On this point, however, Dr. Lewis thinks his observations have been too few for him to speak decisively, and in his summing up says, "that no sufficient evidence exists for considering that vibriones, and such like organisms, prevail to a greater extent in the discharges from persons affected with cholera than in the discharges of other persons, diseased or healthy; but that the vibriones, bacteria, and monads (micrococcus) may not be *peculiar in their nature*, for these *do* vary, may not be the product of a peculiar combination of circumstances, and able to give origin to peculiar phenomena in a predisposed person, is 'not proven.'" To which the reply naturally subjects itself, neither is it proven that they have such origin and powers, and that the burden of proof certainly lies upon those who believe they have—not upon those who believe they have not.

In the latter part of the book Dr. Lewis, after stating the theories of Pettenkofer and Buchanan, in regard to the connection of cholera with the soil and water, gives some observations made by himself at various places in northwestern India on this point; but these are confessedly so imperfect that it is not necessary here to discuss them; and we close, hoping he will, as he hints, at some time in the near future, make an elaborate report upon the subject.

This volume is a most valuable contribution to our science, and in the highest degree creditable to its author, for the carefulness and industry he has displayed in his investigation and his great caution in drawing conclusions.

H. C. W., Jr.

Art. XXIII.—*Germ Theory of Disease.*

1. *Disease Germs; their Supposed Nature; an Original Investigation, with Critical Remarks.* By Lionel S. Beale, M.B., F.R.S., Fellow of Royal College of Physicians; Physician to King's College Hospital, etc. etc. 12mo. pp. 82. Philadelphia: Lindsay & Blakiston.
2. "*On the Real Nature of Disease Germs.*" By Lionel S. Beale, F.R.S., etc., in "The Monthly Microscopical Journal" for October, 1870.
3. "*Medical Aspects of the Germ Theory.*" Two Lectures by Dr. B. W. Richardson, *Med. Times and Gazette*, Oct. 29th and Nov. 5th, 1870.

The views advanced in the volume, the title of which is at the head of this notice, have been held by Dr. Beale for several years, while the facts upon which they are based have been referred to in various papers and lectures during the past seven years. Dr. Beale declares that although the facts are conclusive as regards the living state of the active matter of contagious disease, he is quite unable to subscribe to the arguments advanced in favour of the *Vegetable* Germ Theory of Disease.

The object of the present volume is to determine the nature of the supposed *germs* to which contagious maladies are now attributed.

In this book Dr. Beale first applies the term *Bioplasm* to what in his other publications he calls *germinal matter*, a substitution which has evidently much to recommend it. The mode of origin and growth of the Bioplasm, and that of the formed material resulting from it, are briefly described in the introduction. After this the subject of vegetable germs is taken up and illustrated, first by the *yeast fungus*, which is described as consisting, under a power of 1000 diams., of distinct *oval bodies*, with bud-like projections subsequently to be detached, *minute particles* (detached germs), and a fluid in which both are suspended. These *germs* and *germules* are composed of a central living *bioplasm*, and external *formed material* constituting a *cell wall*, but originating from the bioplasm only. Many of the germules are less than the $\frac{1}{100000}$ of an inch in diameter; but capable of growing like the parent cell, and giving origin to countless descendants. Most important in this connection, is the fact that these little particles are so protected by the surrounding formed matter from the influence of destructive agents, as to retain their vitality for a great length of time.

These spores are also so light as to be easily transported in the atmosphere, and thus constitute *germs in the air*. Certain of these are figured as magnified by the highest powers. Bodies 100 times heavier than these may be suspended in air. "Hence, it is not to be wondered at, that millions of these should exist almost everywhere; floating in the atmosphere, deposited upon everything, and ready to undergo development wherever the conditions may be favorable." (p. 21.) And though millions be destroyed, a single one may develop under suitable circumstances.

With regard to the *detection* of vegetable germs in the air, this was accomplished more than twenty years ago, and by different methods which are detailed.

Referring to Dr. Tyndall's experiment, in which he confirmed the existence of organic particles in the atmosphere, by proving it to be partially combustible, and also that the same truth may be shown by microscopic examination of the dust of the air, Dr. Beale says, no one would dare to make an assertion that the dust of the air *consists* entirely of disease germs, though remarks have been made in scientific journals which have undoubtedly led the public to believe that such an assertion is intended. Prof. Tyndall is also accused of having led people to suppose, "by his discoveries, surmises, assertions, and predictions published